Claims

1. A method of tracking movement of a subject's eye between first and second successively generated video images after a position of the subject's eye in said first video image has been identified, comprising the steps of:

defining a first state vector for the first video image corresponding to the identified position of the subject's eye;

defining an eye template in said second video image based on said first state vector, and defining a search window comprising said eye template and a portion of the second video image surrounding said eye template;

forming a difference image corresponding to differences between said search window and a corresponding portion of said first video image;

processing said difference image to detect a specified movement of the subject's eye and a corresponding center of movement;

if the specified movement of the subject's eye is not detected, defining a second state vector corresponding to the location of the subject's eye in the second video image based on a correlation technique; and

if the specified movement of the subject's eye is detected, defining the second state vector based on the corresponding center of movement.

2. The method of Claim 1, including the steps of:

computing a sum of absolute differences between said search window and a corresponding portion of said first video image; and

setting said second state vector equal to said first state vector if the computed sum of absolute differences is less than a predefined threshold.

3. The method of Claim 1, wherein the step of processing said difference image includes the steps of:

identifying candidate regions of said difference image that are size-wise consistent with facial features of the subject;

establishing an eye model defining image characteristics of the subject's eye and a non-eye model defining image characteristics of facial features other than the subject's eye;

computing deviations of a selected candidate region from said eye model and said non-eye model; and

detecting the specified movement of the subject's eye when the deviation of the selected candidate region from the non-eye model is greater than the deviation of the selected candidate region from the eye model.

4. The method of Claim 3, including the steps of:

successively selecting said candidate regions; and

detecting the specified movement of the subject's eye when at least one of the selected candidate regions has a deviation from the non-eye model that is greater than its deviation from the eye model.

5. The method of Claim 3, including the step of:

detecting said center of movement in accordance with a centroid of the selected candidate region.

6. The method of Claim 1, wherein the step of defining the second state vector based on a correlation technique includes the steps of:

computing correlation values based on a comparison of said eye template with different regions of said search window, and selecting a first region for which the computed correlation value is highest;

establishing an eye model defining image characteristics of the subject's eye and a non-eye model defining image characteristics of facial features other than the subject's eye;

computing deviations of the search window regions from said eye model, and selecting a second region for which the computed deviation is lowest;

defining the second state vector according to a center of the first selected region if said first selected region is determined to be more reliable than said second selected region; and

defining the second state vector according to a center of the second selected region if said second selected region is determined to be more reliable than said first selected region.

7. The method of Claim 6, including the step of:

determining that said first selected region is more reliable than said second selected region when the correction value corresponding to said first selected region exceeds a correlation threshold, and the deviation of said second selected region from said eye model is greater than a deviation of the second selected region from said non-eye model.

8. The method of Claim 6, including the step of:

determining that said second selected region is more reliable than said first selected region when the correction value corresponding to said first selected region is less than a correlation threshold, and the deviation of said second selected region from said eye model is less than a deviation of the second selected region from said non-eye model.

9. The method of Claim 6, including the steps of:

computing a first variance of search window patches surrounding a center of the first selected region, and a second variance of search window patches surrounding a center of the second selected region;

determining that said first selected region is more reliable than said second selected region when the first variance exceeds the second variance; and

determining that said second selected region is more reliable than said first selected region when the second variance exceeds the first variance.